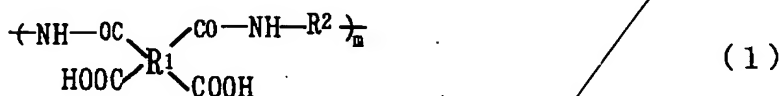


Claims

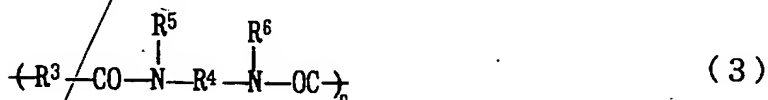
5 ^{Sup} 1. A varnish composition which comprises polymer ingredient containing polyamic acid B represented by formula (1), polyamic acid A represented by formula (2) having a side chain of not less than 3 carbon atoms and N-substituted polyamide represented by formula (3), and a solvent for dissolving the polymer ingredients, and then the varnish composition contains 0.1 to 40% by weight of the polymer ingredient.



10 wherein R¹ is a tetravalent organic radical derived from tetracarboxylic acids, R² is a divalent organic radical derived from diamines, and m is a natural number.



15 wherein R^{1'} is a tetravalent organic radical derived from tetracarboxylic acids, R^{2'} is a divalent organic radical derived from diamines, at least one of the tetravalent and divalent organic radicals has a side chain of not less than 3 carbon atoms, and m' is a natural number.



wherein R³ is a divalent organic radical derived from dicarboxylic acids, R⁴ is a divalent organic radical derived

from diamines, R^5 and R^6 represent a monovalent organic radical or hydrogen in which the percentage of the substitution of the monovalent organic radical is not less than 30% and the organic radical may be plural species, and n is a natural number.

2. The varnish composition of claim 1 wherein the polymer ingredient contains 10 to 99.8% by weight of the polyamic acid B represented by formula (1), and 0.2 to 90% by weight of the combination of the polyamic acid A represented by formula (2) and the N-substituted polyamide represented by formula (3), based on the total amount of the polymer ingredient.

3. The varnish composition of claim 1 wherein the polymer ingredient contains the polyamic acid B represented by formula (1) in the range of 40 to 98% by weight, the polyamic acid A represented by formula (2) and the N-substituted polyamide represented by formula (3), in the range of 1 to 59% by weight respectively, based on the total amount of the polymer ingredient.

4. The varnish composition of any one of claims 1 to 3 wherein R^1 in the formula (1) contains as an essential component a tetravalent organic radical derived from alicyclic tetracarboxylic acids.

5. The varnish composition of any one of claims 1 to 3 wherein R^1 in the formula (1) contains 10 to 100 mole % of a tetravalent organic radical of an alicyclic system, based on the total amount of the tetravalent organic radical R^1 derived from tetracarboxylic acids, and R^2 contains as a

main component at least one of radicals represented by formula (4).



wherein X represents a single bond, CH₂, CH₂CH₂, CH₂CH₂CH₂, CH₂CH₂CH₂CH₂, or C(CH₃)₂, R⁹ and R¹⁰ each independently represent hydrogen or a lower alkyl group, a and b are individually 1 to 2, and o is 0 to 3, provided that when o is 2 to 3, each X may be the same or different from each other.

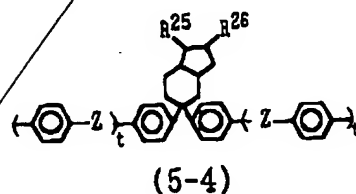
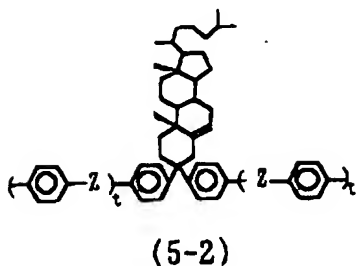
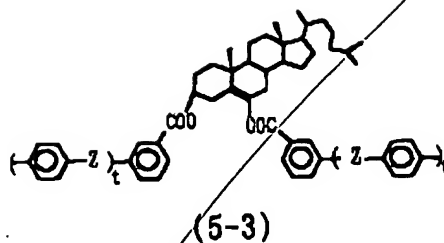
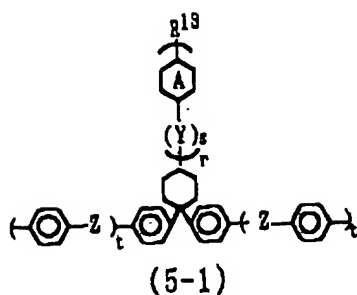
6. The varnish composition of any one of claims 1 to 3 wherein R¹ in formula (1) contains 10 to 100 mole % of a tetravalent radical derived from cyclobutane tetracarboxylic acids, based on the total amount of the tetravalent organic radical R¹ derived from tetracarboxylic acids, and R² contains as a main component at least one of radicals selected from divalent radicals derived from 4,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylethane, 1,4-bis[2-(4-aminophenyl)ethyl]benzene, 1,4-bis(4-aminophenylmethyl)benzene, 1,3-bis[4-(4-aminophenylmethyl)phenyl]propane, or bis[4-(4-aminophenylmethyl)phenyl]methane.

7. The varnish composition of any one of claims 1 to 6 wherein R¹' in formula (2) contains as an essential component a tetravalent organic radical derived from

aromatic or/and alicyclic or/and aliphatic tetracarboxylic acids.

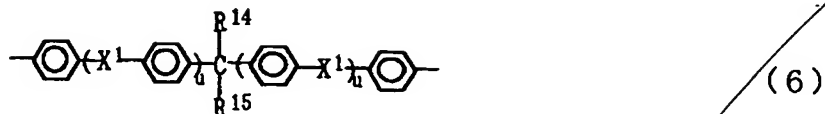
8. The varnish composition of claim 7 wherein $R^{2'}$ in formula (2) is a divalent organic radical having a side chain group of not less than 3 carbon atoms and the content of the radical is 1 to 100 mole% based on the total amount of the divalent organic radical $R^{2'}$.

9. The varnish composition of any one of claims 1 to 6 wherein $R^{1'}$ in formula (2) contains as an essential component a tetravalent organic radical derived from pyromellitic acid or/and a cyclobutanetetracarboxylic acid, and $R^{2'}$ contains 1 to 100 mole% of at least one of divalent organic radicals represented by formulas (5-1) to (5-4), (6), (7), or (8) and 99 to 0 mole% of at least one of divalent organic radicals represented by formula (4), based on the total amount of the divalent organic radical $R^{2'}$.

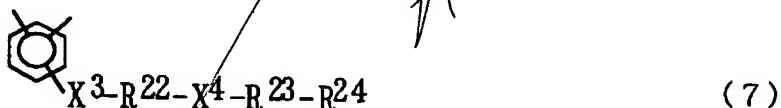


wherein R^{13} , R^{25} and R^{26} each independently represent hydrogen or an alkyl group of 1 to 12 carbon atoms, Y represents a single bond or CH_2 , ring A represents a benzene ring or a cyclohexane ring, Z represents a single bond, CH_2 , CH_2CH_2 , or oxygen, r is a positive number of 0 to 3, s is a positive number of 0 to 5, and t is a positive number of 0 to 3, provided that when t is 2 to 3, each Z may be the same or different from each other. Further, hydrogen on any benzene or cyclohexane ring may be replaced by a lower alkyl group. The steroid skeleton in formulas (5-2) and (5-3) may be the one wherein any ring is reduced, enlarged or cleaved, the one wherein it contains a three-membered ring, the one wherein an unsaturated bond in any position is increased or decreased, or the one wherein hydrogen or an alkyl group in

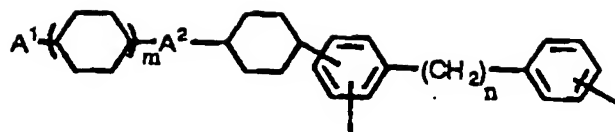
any position may be replaced by any monovalent organic group.



wherein X^1 represents a single bond, CH_2 , CH_2CH_2 , or oxygen, R^{14} and R^{15} each independently represent hydrogen, an alkyl group or a perfluoroalkyl group of 1 to 12 carbon atoms, at least one of them represents an alkyl group or a perfluoroalkyl group of not less than 3 carbon atoms, and u is 0 to 3, provided that when u is 2 to 3, each X^1 may be the same or different from each other. Further, hydrogen on any benzene ring may be replaced by a lower alkyl group.

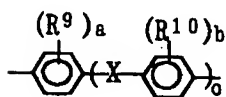


wherein X^3 and X^4 each independently represent a single bond, O, COO, OCO, NH, CONH, or $(\text{CH}_2)_n$, R^{22} and R^{23} each independently represent a single bond, a group of 1 to 3 rings having an aromatic ring or/and an alicyclic ring (When R^{22} or/and R^{23} have 2 or 3 rings, these rings may be bonded with X^3 and X^4) or a steroid group, R^{24} represents hydrogen, fluorine, hydrocarbon group, fluorinated hydrocarbon group, an alkoxy group, a cyano group or OH group, and n is a positive number of 1 to 5.



(8)

wherein A¹ is hydrogen or a straight or branched-chain alkyl group of 1 to 12 carbon atoms in which one methylene or any non-adjacent methylene may be replaced by oxygen, A² is a single bond or an alkylene group of 1 to 5 carbon atoms in which one methylene or any non-adjacent methylene may be replaced by oxygen, m is 0 to 3, and n is 1 to 5.



(4)

wherein X represents a single bond, CH₂, CH₂CH₂, CH₂CH₂CH₂, CH₂CH₂CH₂CH₂, or C(CH₃)₂, R⁹ and R¹⁰ each independently represent hydrogen or a lower alkyl group, a and b are 1 to 2 respectively, and o is 0 to 3, provided that when o is 2 to 3, each X may be the same or different from each other.

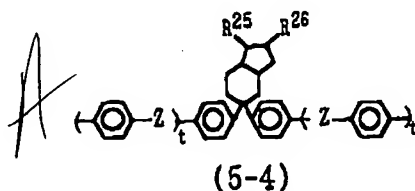
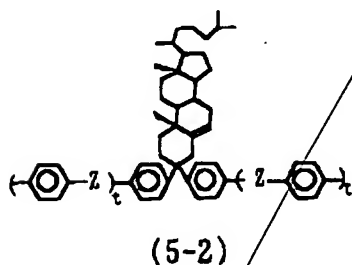
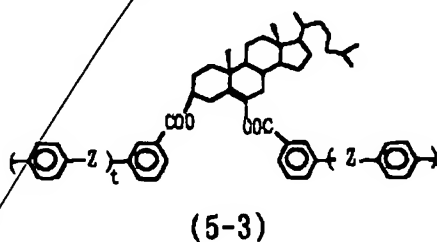
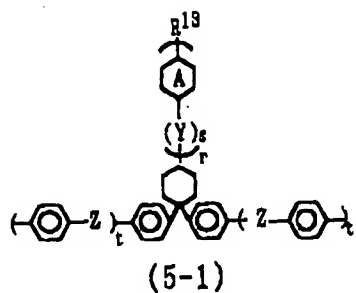
10. The varnish composition of any one of claims 1 to 9 wherein R³ in formula (3) contains as a main component a divalent organic radical derived from aromatic or/and alicyclic or/and aliphatic dicarboxylic acids, R⁴ contains as a main component a divalent organic radical derived from aromatic or/and alicyclic or/and aliphatic diamines, R⁵ and R⁶ represent a monovalent organic radical or hydrogen in which a percentage of the substitution of the monovalent organic radical is not less than 50%, the organic radical may be plural species, and at least one of R³, R⁴, R⁵, or R⁶

is a radical having a side chain group of not less than 3 carbon atoms, and n is a natural number.

11. The varnish composition of claim 10 wherein R^4 in formula (3) is a diamine radical having a side chain group of not less than 3 carbon atoms, the content of which is 1 to 100 mole% based on the total amount of the diamine radicals R^4 , and R^5 and R^6 represent the monovalent organic radical, the percentage of the substitution of which is not less than 70%.

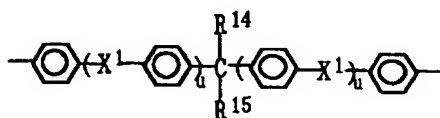
12. The varnish composition of any one of claims 1 to 9 wherein R^3 in formula (3) contains as a main component at least one of divalent organic radicals derived from dicarboxylic acids selected from terephthalic acid, isoterephthalic acid, 1,4-cyclohexanedicarboxylic acid, 4,4'-biphenyldicarboxylic acid, 4,4'-diphenylmethanedicarboxylic acid, 4,4'-diphenylethanedicarboxylic acid, 4,4'-diphenylpropanedicarboxylic acid, 4,4'-diphenylhexafluoropropanedicarboxylic acid, 2,2-bis(phenyl)propanedicarboxylic acid, 4,4'-terphenyldicarboxylic acid, 2,6-naphthalenedicarboxylic acid, or 2,5-pyridinedicarboxylic acid, R^4 contains 1 to 100 mole% of at least one of divalent organic radicals represented by formulas (5-1) to (5-4), (6), (7), or (8) and 99 to 0 mole% of at least one of divalent organic radicals represented by

formula (4), based on the total amount of the divalent organic radical R^4 , and R^5 and R^6 contain at least one of monovalent organic radicals selected from a lower alkyl group, phenyl, benzyl, cyclohexyl, cyclohexylmethyl, naphthyl, or 9-anthrylmethyl, the percentage of the substitution of which is not less than 80%.



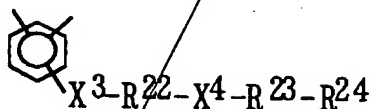
wherein R^{13} , R^{25} and R^{26} each independently represent hydrogen or an alkyl group of 1 to 12 carbon atoms, Y represents a single bond or CH_2 , ring A represents a benzene ring or a cyclohexane ring, Z represents a single bond, CH_2 , CH_2CH_2 , or oxygen, r is a positive number of 0 to 3, s is a positive number of 0 to 5, t is a positive number of 0 to 3, provided that when t is 2 to 3, each Z may be the same or different from each other. Further, hydrogen on any benzene or cyclohexane ring may be replaced by a lower alkyl group. The steroid skeleton in formulas (5-2) and (5-3) may be the

one wherein any ring is reduced, enlarged or cleaved, the one wherein it contains a three-membered ring, the one wherein an unsaturated bond in any position is increased or decreased or the one wherein a hydrogen or an alkyl group in any position may be replaced by any monovalent organic group.



(6)

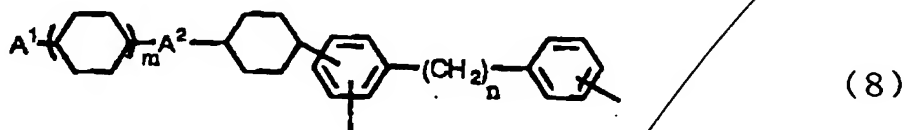
wherein X^1 represents a single bond, CH_2 , CH_2CH_2 or oxygen, R^{14} and R^{15} each independently represent hydrogen, an alkyl group or a perfluoroalkyl group of 1 to 12 carbon atoms, in which at least one of them represents an alkyl group or a perfluoroalkyl group of not less than 3 carbon atoms, and u is 0 to 3, provided that when u is 2 to 3, each X^1 may be the same or different from each other. Further, hydrogen on any benzene ring may be replaced by a lower alkyl group.



(7)

wherein X^3 and X^4 each independently represent a single bond, O, COO, OCO, NH, CONH, or $(\text{CH}_2)_n$, R^{22} and R^{23} each independently represent a single bond, a group of 1 to 3 rings having an aromatic ring or/and an alicyclic ring (When R^{22} or/and R^{23} have 2 or 3 rings, these rings may be bonded with X^3 and X^4) or a steroid group, R^{24} represents hydrogen,

fluorine, hydrocarbon group, fluorinated hydrocarbon group, an alkoxy group, a cyano group or OH group, and n is a positive number of 1 to 5.



wherein A¹ is hydrogen or a straight- or branched-chain alkyl group of 1 to 12 carbon atoms in which one methylene or any non-adjacent methylene may be replaced by oxygen, A² is a single bond or an alkylene group of 1 to 5 carbon atoms in which one methylene or any non-adjacent methylene may be replaced by oxygen, m is 0 to 3, and n is 1 to 5.

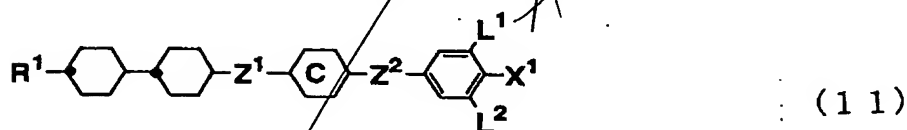
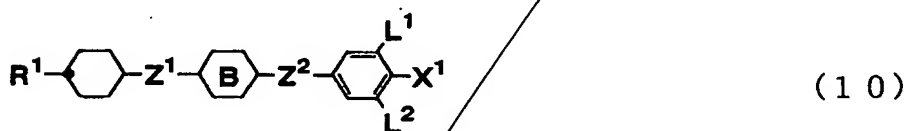


wherein X represents a single bond, CH₂, CH₂CH₂, CH₂CH₂CH₂, CH₂CH₂CH₂CH₂ or C(CH₃)₂, R⁹ and R¹⁰ each independently represent hydrogen or a lower alkyl group, a and b are individually 1 to 2, and o is 0 to 3, provided that when o is 2 to 3, each X may be the same or different from each other.

13. A varnish composition for a liquid crystal aligning film defined in any one of claims 1 to 12.

14. A liquid crystal display element using a varnish composition defined in claim 13.

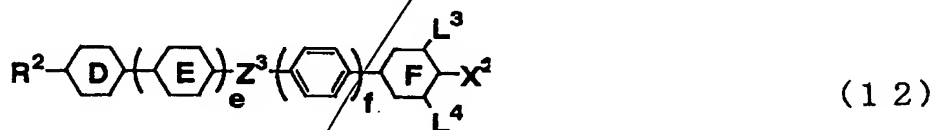
15. A liquid crystal display element wherein a liquid crystal composition containing at least one of liquid crystalline compounds represented by formulas (9), (10) and (11) is applied to the liquid crystal display element defined in claim 14.



wherein R¹ represents an alkyl group of 1-10 carbon atoms in which any non-adjacent methylene may be replaced by -O- or -CH=CH- in which any hydrogen may be replaced by fluorine; X¹ represents fluorine, chlorine, -OCF₃, -OCF₂H, -CF₃, -CF₂H, -CFH₂, -OCF₂CF₂H, or -OCF₂CFHCF₃; L¹ and L² each independently represent hydrogen or fluorine; Z¹ and Z² each independently represent 1,2-ethylene, 1,4-butylene, -COO-, -CF₂O-, -OCF₂-, -CH=CH-, or a single bond; ring B represents trans-1,4-cyclohexylene, 1,3-dioxane-2,5-diyl or 1,4-phenylene in which hydrogen may be replaced by fluorine; ring C

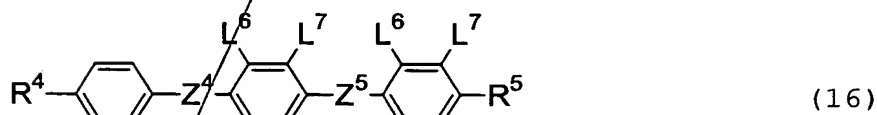
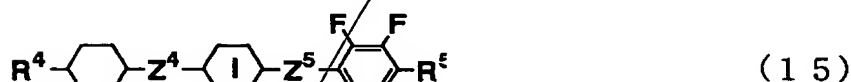
represents trans-1,4-cyclohexylene or 1,4-phenylene in which hydrogen may be replaced by fluorine.

16. A liquid crystal display element wherein a liquid crystal composition containing at least one of liquid crystalline compounds represented by formulas (12) and (13) is applied to the liquid crystal display element defined in claim 14.



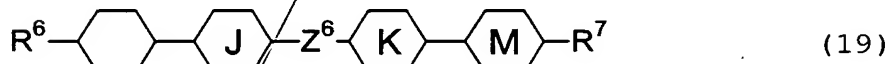
wherein R^2 and R^3 each independently represent an alkyl group of 1 to 10 carbon atoms in which any non-adjacent methylene may be replaced by $-\text{O}-$ or $-\text{CH}=\text{CH}-$ in which any hydrogen may be replaced by fluorine; X^2 represents $-\text{CN}$ or $-\text{C}\equiv\text{C}-\text{CN}$; ring D represents trans-1,4-cyclohexylene, 1,4-phenylene, 1,3-dioxane-2,5-diyl, or pyrimidine-2,5-diyl; ring E represents trans-1,4-cyclohexylene, pyrimidine-2,5-diyl or 1,4-phenylene in which hydrogen may be replaced by fluorine; ring F represents trans-1,4-cyclohexylene or 1,4-phenylene, Z^3 represents 1,2-ethylene, $-\text{COO}-$ or a single bond; L^3 , L^4 and L^5 each independently represent hydrogen or fluorine; e, f and g each independently represent 0 or 1.

17. A liquid crystal display element wherein a liquid crystal composition containing at least one of liquid crystalline compounds represented by formulas (14), (15) and (16) is applied to the liquid crystal display element defined in claim 14.



wherein R^4 and R^5 each independently represent an alkyl group of 1 to 10 carbon atoms in which any non-adjacent methylene may be replaced by $-\text{O}-$ or $-\text{CH}=\text{CH}-$ and any hydrogen may be replaced by fluorine; rings G and I each independently represent trans-1,4-cyclohexylene or 1,4-phenylene; L^6 and L^7 each independently represent hydrogen or fluorine, but does not represent hydrogen at the same time; Z^4 and Z^5 each independently represent 1,2-ethylene, $-\text{COO}-$ or a single bond.

18. A liquid crystal display element wherein a liquid crystal composition containing as a first component at least one of liquid crystalline compounds represented by formulas (9), (10) and (11) and as a second component at least one of liquid crystalline compounds represented by formulas (17), (18) and (19) is applied to the liquid crystal display element defined claim 14.



wherein R^6 and R^7 each independently represent an alkyl group of 1 to 10 carbon atoms in which any non-adjacent methylene may be replaced by $-O-$ or $-\text{CH}=\text{CH}-$ and any hydrogen may be replaced by fluorine; ring J, ring K and ring M each independently represent trans-1,4-cyclohexylene, pyrimidine-2,5-diyl or 1,4-phenylene in which hydrogen may be replaced by fluorine; and Z^6 and Z^7 each independently represent 1,2-ethylene, $-\text{C}\equiv\text{C}-$, $-\text{COO}-$, $-\text{CH}=\text{CH}-$ or a single bond.

19. A liquid crystal display element wherein a liquid crystal composition containing as a first component at least one of liquid crystalline compounds represented by formulas (12) and (13) defined in claim 16 and as a second component at least one of liquid crystalline compounds represented by formulas (17), (18) and (19) defined in claim 18 is applied to the liquid crystal display element defined in claim 14.

20. A liquid crystal display element wherein a liquid crystal composition containing as a first component at least one of liquid crystalline compounds represented by formulas (14), (15) and (16) defined in claim 17 and as a second component at least one of liquid crystalline compounds represented by formulas (17), (18) and (19) defined in claim 18 is applied to the liquid crystal display element defined in claim 14.

21. A liquid crystal display element wherein a liquid crystal composition containing as a first component at least one of liquid crystalline compounds represented by formulas (9), (10) and (11) defined in claim 15, as a second component at least one of liquid crystalline compounds represented by formulas (12) and (13) defined in claim 16, and as a third component at least one of liquid crystalline compounds represented by formulas (17), (18) and (19) defined in claim 18 is applied to the liquid crystal display element defined in claim 14.

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